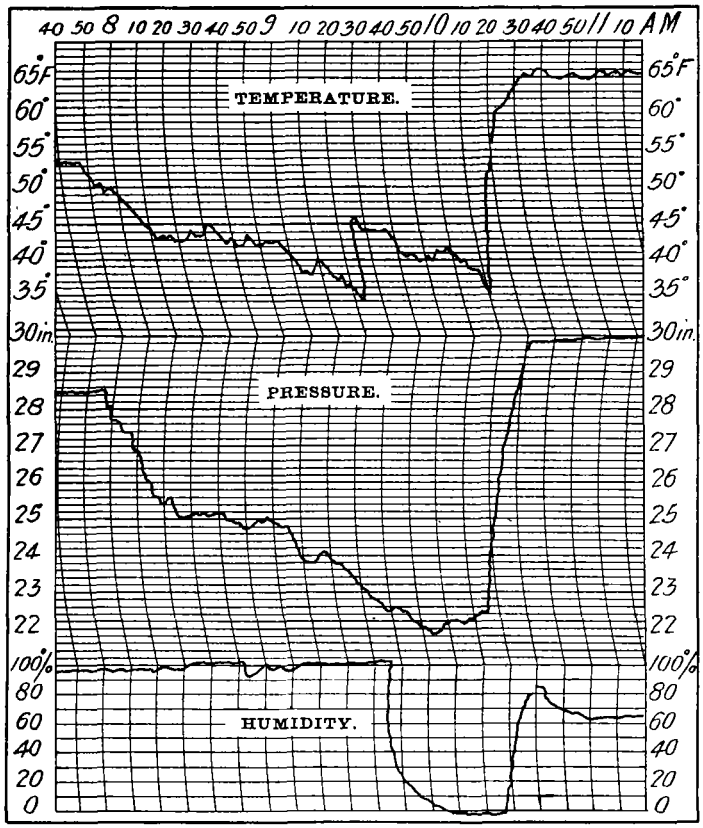

FIG. 1.—Meteorograph tracings for kite flight of April 5, 1906.

Kite flight at Mount Weather, Bluemont, Va., April 5, 1906.

At kite.						At station.					Remarks.
Time.	Above sea level.	Pressure.	Temperature.	Relative humidity.	Wind direction.	Pressure.	Temperature.	Relative humidity.	Wind. Dir.	Wind. Vel.	
a. m.	*Feet.*	*Ins.*	*° F.*	*%*		*Ins.*	*° F.*	*%*		*m. p. h.*	
7:47	1725	28.2	53	95	n w.	28.2	53	82	n w.	21	Cloudiness, 10 stratus, with occasional light sprinkling rain.
7:49	2155	27.8	51	96	.....	.....	.....	.....	.....	.....	
7:53	2565	27.2	49.5	97	.....	.....	.....	.....	.....	.....	
7:56	2925	27.0	48.8	98	w-n w	.....	.....	.....	.....	.....	
8:00	3440	26.5	48	99	w.	28.2	52	....	n w.	15	
8:04	4210	25.8	46.5	99	.....	.....	.....	.....	.....	.....	
8:10	4920	25.2	43	99	.....	.....	.....	.....	n.	.....	Kite entered scud; reappeared several times.
8:14	5260	24.9	42	100	.....	.....	52	....	n w.	9	
8:50	5580	24.7	41	98	w.	.....	53	85	....	.....	Second kite attached.
9:07	6590	23.9	37	100	.....	.....	.....	.....	.....	.....	First kite at base of clouds.
9:12	6200	23.7	39	100	.....	.....	53	....	n w.	9	
9:24	7330	22.6	34	100	.....	.....	.....	.....	.....	.....	First kite hidden at times by lower clouds.
9:29	8025	22.3	44	34	.....	.....	54	....	n w.	16	
9:37	8220	22.0	43.5	10	.....	.....	.....	.....	.....	.....	
9:45	9000*	21.6	40	2	.....	.....	54	....	w.	12	
10:08	.....	22.2	38	0†	.....	28.15	55	...	n w.	12	Upper kite with meteorograph broke away while hidden by cl'ds.
10:22	.....	29.5	59.5	85	.....	.....	56	....	n w.	11	Landed in valley about 12 miles due east from station.

* Based on barograph tracing; other elevations based on angular elevation of kite and length of wire out. † A correction of 5 to 8 per cent should probably be applied to the lower portion of the scale of the hair hygrometer.

NOTE.—Number and kind of kites: 2 Hargrave-Marvin kites with a total lifting surface of 98 square feet. Station elevation, 1725 feet. Greatest elevation above station, 7300 feet. Greatest elevation above sea level, 9000 feet. Greatest length of wire out, 11000 feet

and the loss of the upper kite was then soon made evident. The kite broke away at an elevation of about 7000 feet above the station. It was found the following morning at a point in the valley about 12 miles due east from the observatory. The meteorograph traces showed clearly the time at which the kite broke away and the time at which it struck the ground; a difference of about eleven minutes indicates an average velocity of the kite after it broke away of over one mile per minute. The accident was due to the breaking of the steel wire at the point of attachment of the upper kite. In landing the second kite, the length of the line between the upper and lower kites (about 5000 feet) was stretched across the tops of the forest trees on the mountain side, and was reeled in without any difficulty and without loss. The upper kite landed upon some rocks in the valley, breaking some of the sticks; the instrument was not injured in the slightest degree, while the record was distinct and complete. The tracings of the meteorograph are reproduced in fig. 1.

WHERE ARE THE OLD RECORDS OF HAITI?

The efforts lately made by the Editor and his colleagues to collect and publish such data as we can, relative to the climate of Haiti, have led us to hope that we may recover the elaborate records kept in that country by its French residents between 1750 and the Napoleonic era. These records were collected most assiduously both by Cotte in Paris and by Moreau de St. Méry. The latter published extracts in his Description Topographique, printed at Philadelphia in 1797. The former published tabular data in full in the annual volumes of the Histoire de la Société royale de Médicine and also in his Météorologie, but he must have had large manuscript collections that are not yet published. The following letter from a member of the council of the Astronomical and Meteorological Society of Port au Prince shows that antiquarians may still hopefully search for these lost documents in New Orleans, La., in Philadelphia, Pa., and in France:

[Translation.]

PORT AU PRINCE, *August 24, 1905.*

CONSTANTIN,
Director of the Observatory of the Astronomical and Meteorological Society of Port au Prince.

MY DEAR BROTHER: In reply to your communication in regard to the meteorological observations of Le Febure des Hayes, made from 1772 to 1788 at Tivoli, or Tifoly, in the parish of Jeremie, I would say to you that I have already instituted a search on this same subject for Mr. Leger, our minister to Washington, but I found nothing.

If Mr. Le Febure des Hayes had willed his manuscript to the club of the Philadelphians and to the Royal Society of Sciences and Arts in the same town,[1] these papers should be in France. In 1803 the French, in evacuating the Cape, did not leave anything in the colony they were forced to abandon, but took with them all the archives of this portion of the French Empire.

The memoirs or studies, as far as published either by the Royal Society or by the club, may be found in New Orleans, La., and in Philadelphia, Pa.; these two American cities received a great many French people after the evacuation of Santo Domingo. In Europe everything relating to the old colonies will be found in the archives of Versailles; at the Academy of Sciences of Paris; at the Academy of Bordeaux; at Brussels, at Mr. Haylaerts's, who was formerly consul from Haiti to the residence in that city. I know that Mr. Haylaerts collected a great many documents relative to the ancient colony of Santo Domingo and to the independent state of Haiti. There were a great many works on Haiti at the Library of Americana, Rue Gusuégan. I do not know whether this establishment is still in existence. At Port au Prince there are a great many pamphlets, books, thin bound books, notes, and memoirs, in the library of the Little Seminary of St. Martial (Petit Séminaire St. Martial), to which Lieutenant Pradiness had confided a part of his collection.

I shall be happy if this information is of any use to the meteorological bureau at Washington. In this hope I beg you to accept, dear brother, the assurance of my most affectionate sentiments.

(Signed) JUSTIN BOUZON.

THE ZODIACAL LIGHT.

By Mr. MAXWELL HALL. Dated Montego Bay, Jamaica, W. I., February 12, 1906.

It is now thirty years since I first measured the breadth of the zodiacal light at various distances from the sun. The observations were made at Kempshot, Jamaica, at an elevation of about 1800 feet above sea level, and the results were pub-

[1] Le Cap or Cape Haïtien.

lished some years afterwards in Jamaica Weather Report No. 27, for May, 1883. They are given in Table 1.

TABLE 1.—*Results of the first series of observations of zodiacal light at Kempshot, Jamaica, W. I.*[1]

Angular distance from sun.	Breadth of zodiacal light.
°	°
30	41.4
40	38.7
50	36.1
60	33.4
70	30.7
80	28.1
90	25.5
120	17.8
180	7.0

In the absence of the moon the zodiacal light was always seen as a band following the ecliptic; and it appeared to me, more particularly with regard to the portions at considerable distances from the sun, to be a terrestrial phenomenon.

After a good many years it became clear that no ordinary observations would be able to prove the true nature of the light, and then the spectroscope was applied. I borrowed a large instrument from the Royal Astronomical Society of London and had it arranged for this work. The zodiacal light showed no bright or dark lines; its spectrum, what there was of it, was continuous, and coincided with the brightest part of the solar spectrum; and to all intents and purposes it was identical with the spectrum of twilight.

TABLE 3.—*Results of observations of the zodiacal light at Jamaica during 1899 and 1901.*

Distance from sun.		Breadth.	
°		°	
28		60	
32		27	
34	33°	16	37°
34		24	
35		56	
45		22	
45	46°	40	29°
49		25	
51		30	
53		23	
55		27	
55		20	
55		25	
55	55°	25	26°
56		26	
56		27	
56		27	
58		28	
59		26	
65		27	
73		19	
74		25	
75		24	
76	75°	15	20°
77		23	
80		11	
82		15	
103		12	
105		5	
108	108°	17	12½
111		18	
114		11	
148		12	

Since that time I have adapted a small direct vision spectroscope for this purpose; the collimating lens was removed, the slit was put several inches away, and an adjustment was made between the width of the slit and its distance from the train of prisms. In this way I got a slit a tenth of an inch wide, and an inch and a half in length, which not only allows all the chief solar lines to be seen in the daytime, but also the faint continuous spectrum of the zodiacal light at night. All that I could gather from these observations showed that the zodiacal light was reflected light from the sun.

Then, in 1899 and 1901, I made a series of most careful observations, not only of the breadth of the light, but of its boundaries at different distances from the sun. My object was to see whether such careful work would do what time and ordinary observation had failed to do. These observations are given in detail in Table 2; the results are summarized in Table 3.

Sometimes the breadth at various points was deduced from the stars, sometimes it was measured by a rough, simple instrument, but in the latter case the process was first to find a star on the central line of the zodiacal light, and then to measure through that star across the line of the light. Both methods had their advantages.

The breadths at 30°, 40°, and 50° were much as before; beyond this the new breadths diminished by 5° or so, agreement occurring again near opposition, or 180°.

Combining the two series, the breadths given in Table 4 have been adopted.

TABLE 4.—*General results of the first and second series of observations.*

Distance from sun.	Breadth of zodiacal light.
°	°
30	44
40	38
50	33
60	29
70	25
80	21
90	18
120	13
180	6

Instead of the light being bounded by straight lines from the horizon upward the lines are now curved as in the accompanying fig. 1, which gives an idea of the general appearance of the zodiacal light when it stands at a right angle to the horizon in the evenings in the month of March; and it will be noticed that the boundaries are so curved that we may continue them below the horizon, assuming that there are no cusps at the junction of the two branches, at 0° from the sun. Thus we get the following values:

Distance from the sun.	Breadth of zodiacal light.
°	°
0	61
10	56
20	50

Now at an altitude of 8000 feet in the Alps in Switzerland, Prof. Simon Newcomb has recently made some observations at midnight on that part of the zodiacal light at 0° from the sun,[2] and found the breadth as much as 70°.

The difference between my 61° and his 70° is due to the following circumstance. In the Tropics there is always much diffuse light along the horizon at night, which so combines with the zodiacal light as to make its breadth difficult or impossible to observe on or near the horizon; and I am aware that my breadths near both the sun and the horizon were underestimated.[3]

With regard to the gegenschein, or counterglow, this is a somewhat stronger illumination, more or less opposite the sun, and irregular in every way; sometimes it is not visible, sometimes it is very distinct; sometimes it is a round spot, sometimes it is no broader than the usual 6° or 7° at 180° from the sun, but as much as 30° in length. When the zodiacal light was regarded as a terrestrial phenomenon the counterglow was supposed to be due to the concentration of rays of light swept back from the earth by the action of the sun.

[1] The intermediate breadths, 90°, 25.5; 100°, 22.9; 110°, 20.3; 120°, 17.8°; 130°, 15.3; 140°, 15.0; 150°, 10.8; 160°, 8.9; 170°, 7.6; as originally printed in the weather report of the Jamaica Gazette for June 21, 1883, although now omitted by Mr. Hall, are here added as being of interest to all students of this subject.—EDITOR.

[2] Query: "Having the same longitude as the sun"?—EDITOR.

[3] Thus, on March 5, 1899, the following note was made: "At 7h 20m the zodiacal light combined with twilight at the horizon so that it was 70° broad along the horizon."

TABLE 2.—*Second series of observations of the zodiacal light in Jamaica, 1899 and 1901.*

Date.	Hour.	Branch.	Longitude.	Latitude.	Breadth.	Distance from sun.	Starlight.	Place.	Notes.	Sun's longitude.
			°	°	°	°				°
1899.										
Jan. 8....	7 p. m ...	E.	323	0	16	34	Bright	K.	From β Aquarii to beyond δ Capricorni by half the distance between β Aquarii and δ Capricorni....	289
	7 p. m.....	E.	5	— 3	15	76	....do	K.	Between γ Pegasi and β Ceti and nearer γ. Width less than half the distance.....	289
	7 p. m.....	E.	34	?	5	105	....do	K.	South of α and β Arietis. Faint. About 5° wide. Position of center not measured. Zodiacal light fainter than usual. Stopped by Milky Way.	289
Jan. 9....	7 p. m.....	E.	335	0	22	45	....do	B. H.	From α Aquarii to 2° beyond δ Aquarii.....	290
	7 p. m.....	E.	324	— 3	24	34	....do	B. H.	From β Aquarii to two-thirds the distance between δ Capricorni and Fomalhaut; brightest at δ Capricorni; faint below Aries; as the zodiacal light set it seemed to widen.	290
Jan. 10...	8 p. m.....	E.	356	— 1	27	65	Dim	B. H.	Breadth measured; half an hour later it was 30°, and then the sky clouded.....	291
Jan. 11...	5 a. m.....	W.	242	+ 1	25	49	Bright	B. H.	Center at β Scorpii. Breadth measured. Much diffused light. Venus troublesome. Zodiacal light traced to Mars.	291
	8 p. m.....	E.	9	— 2	23	77	Dim	B. H.	Center between γ Pegasi and η Ceti. Zodiacal light dim	292
Jan. 12...	4 a. m.....	W.	189	+ 3	12	103	Bright	B. H.	Center at γ Virginis. Diffused light	292
	4 a. m.....	W.	218	+ 1	25	74	....do	B. H.	Center at Jupiter. Zodiacal light visible as far as Mars. Venus rising.....	292
Jan. 15...	4:30 a. m.	W.	242	+ 2	23	53	....do	K.	Center 1° north of β Scorpii. Zodiacal light faint from γ Virginis to Regulus	295
Jan. 17...	2 a. m.....	W.	189	+ 3	17	108	Brilliant..	K.	Center at γ Virginis	297
	2 a. m.....	W.	149	+ 1	12	148	....do	K.	Center at Regulus	297
	3 a. m.....	W.	224	0	19	73	....do	K.	Center at α Libræ.....	297
	3 a. m.....	W.	242	+ 2	20	55	....do	K.	Center at 1° north of β Scorpii	297
Jan. 20...	3 a. m.....	W.	189	+ 3	18	111	Bright ...	B. H.	Center at γ Virginis	300
Jan. 21...	5 a. m.....	W.	246	+ 6	25	55	Brilliant..	K.	Zodiacal light faint. Center between β Scorpii and ζ Ophiuchi. (Venus kept out of sight.).....	301
Jan. 22...	4 a. m.....	W.	246	+ 6	27	56	...do	K.	Zodiacal light faint. Center as in last observation. Gegenschein in Cancer; it appears as a strengthening of the band for about 10° in length. G. = 125°. Up to the present it has been impossible to see the gegenschein on account of the Milky Way and Mars. (Venus kept out of sight.)	302
Jan. 31...	7 to 8 p. m.	E.	10	— 2	26	59	....do	K.	Zodiacal light very bright. Center between γ Pegasi and η Ceti. Breadth from 1° s. f. γ to 3° n. p. η. Gegenschein large and diffused.	311
Feb. 1....	7 to 8 p. m.	E.	10	— 2	28	58	Bright	B. H.	Zodiacal light very bright. Very much broader at horizon than at Kempshot. Breadth from γ Pegasi to 2° n. p. η Ceti. Center at half breadth.	312
	7 to 8 p. m.	E.	357	?	40	45	....do	B. H.	40° broad, 20° above horizon. Gegenschein doubtful	312
Feb. 5....	7 p. m. ...	E.	345	?	60	28	....do	K.	Zodiacal light very bright. Breadth 12° above horizon at 7:05 p. m.....	317
	7 p. m....	E.	352	?	56	35	....do	K.	Zodiacal light very bright. Breadth 15° above horizon at 7:20 p. m.....	317
	7 p. m.....	E.	8	— 1	30	51	....do	K.	Between 1° n. γ Pegasi to η Ceti. Gegenschein between Præsepe and the sickle in Leo. G.=133°. Latitude +3°. A few clouds about.	317
Feb. 6....	2:30 a. m..	W.	.....	.....	.....	.....	Brilliant..	K.	Much diffused light. Zodiacal light faint. Branch traced to the gegenschein, which is very plain between Regulus and Præsepe. G. = 135°. Lat. 0°.	317
	2:30 a. m..	W.	242	+ 5	24	75	....do	K.	Breadth from π Scorpii to δ and ε Ophiuchi. Moon rose at 2:55 a. m.....	317
Mar. 4*..	7 to 8 p. m.	E.	40	— 2	27	56	Dim	K.	Zodiacal light very bright. Breadth from α Arietis to α Ceti, but greatest illumination nearer α Arietis instead of midway. Gegenschein very plain between Regulus and β Virginis, 30° in length. G. = 160°. Lat. = 0°.	344
Mar. 5 ...	7:20 to 9 p. m.	E.	40	— 2	27	55	Bright	K.	Zodiacal light very bright. At 7:20 breadth from α Arietis toward α Ceti was only 20°; at 9 p. m. about 10° above horizon it was 27°. This broadening was noticed last night also. The brightest part of the zodiacal light is on the ecliptic and not at —2°. At 7:20 the zodiacal light combined with twilight at the horizon so that it was 70° broad along horizon. Gegenschein as last night.	345
Mar. 20..	4:30 to 5 a. m.	W.	.....	.....	.....	.....	....do	K.	Zodiacal light very feeble. Venus interferes below the Milky Way. Above Milky Way zodiacal light not seen till near the gegenschein on the ecliptic near β Leonis. G. = 170°. The zodiacal light was to the north of Venus. No measures possible.	0
1901.										
July 21...	4 a. m.....	W.	63	— 1	25	55	Dim	K.	Center between η Tauri and α Tauri	118
	4 a. m.....	W.	4	— 1	11	114	....do	K.	Center on line from α Andromedæ through γ Pegasi at equal distance beyond γ Pegasi. Zodiacal light barely seen 20° beyond this point, the sky getting very dim. Zodiacal light faint on the whole.	118
July 22...	3 a. m.....	W.	37	— 1	15	82	....do	K.	Center between α Arietis and γ Ceti	119
	3 a. m. ...	W.	4	+ 2	.....	115	...do	K.	Center on line from α Andromedæ through γ Pegasi and three-fourths the distance beyond the latter. Zodiacal light can not be seen beyond; dim sky.	119
July 23...	4 a. m.....	W.	.....	.....	.....	.....	.....	K.	Zodiacal light very bright near horizon, very dim near Aries, where sky also becomes dim	120
	4 a. m.....	W.	88	— 1	27	32	Bright	K.	Center between α Orionis and θ Aurigæ; 27° broad	120
	4 a. m.....	W.	33	+ 1	.....	37	....do	K.	Center between β and ζ Tauri and nearer the latter.....	120
	4 a. m.....	W.	63	— 1	.....	57	Dim	K.	Center between η and α Tauri	120
	4 a. m.....	W.	40	0	11	80	....do	K.	Center between α Arietis and α Ceti and nearer the former	120
Sept. 10..	4 a. m.....	W.	111	— 2	26	56	Bright ...	K.	Center between Procyon and Castor. Small moon 10° above eastern horizon	167
			0	— 3	26	167	....do	K.	The gegenschein appeared very broad between β Ceti and a point between α and γ Pegasi; breadth 26°, tapering up from the western horizon. The band across the sky was hardly seen; perhaps the moon interfered. The gegenschein was very uniform, no central condensation. G. = 0°. Latitude = —3°.	167
Oct. 1....	8 p. m.....	E.	212	+17	.....	24	....do	K.	Zodiacal light greatly diffused along the western horizon. The light extends between Arcturus and Venus up to the stars in the head of Scorpio. The band was not seen, but the gegenschein was pretty plain. The very small inclination of the zodiacal light to the horizon is due to the diffused light along the horizon.	188
			240	0	.....	52	....do	K.		
Oct. 5....	8 p. m.....	E.	.....	.....	.....	.....	....do	K.	Zodiacal light very clear. Band visible. Gegenschein very plain. It appeared as a feeble zodiacal light tapering above the eastern horizon; same form; dull, uniform light; 20° above the horizon it was 20° in width and tapered up about 40° above the horizon. Longitude 0°. G. = 20°.	192

Abbreviations in the above table: Branch, E. or W. of sun. Scale of starlight: Dim, bright, brilliant. Place: K. = Kempshot; B. H. = Brandon Hill, Montego Bay. G. = the longitude of the gegenschein; s. f. = south, following; n. p. = north, preceding. * Absent from station during the interval February 6 to March 4.

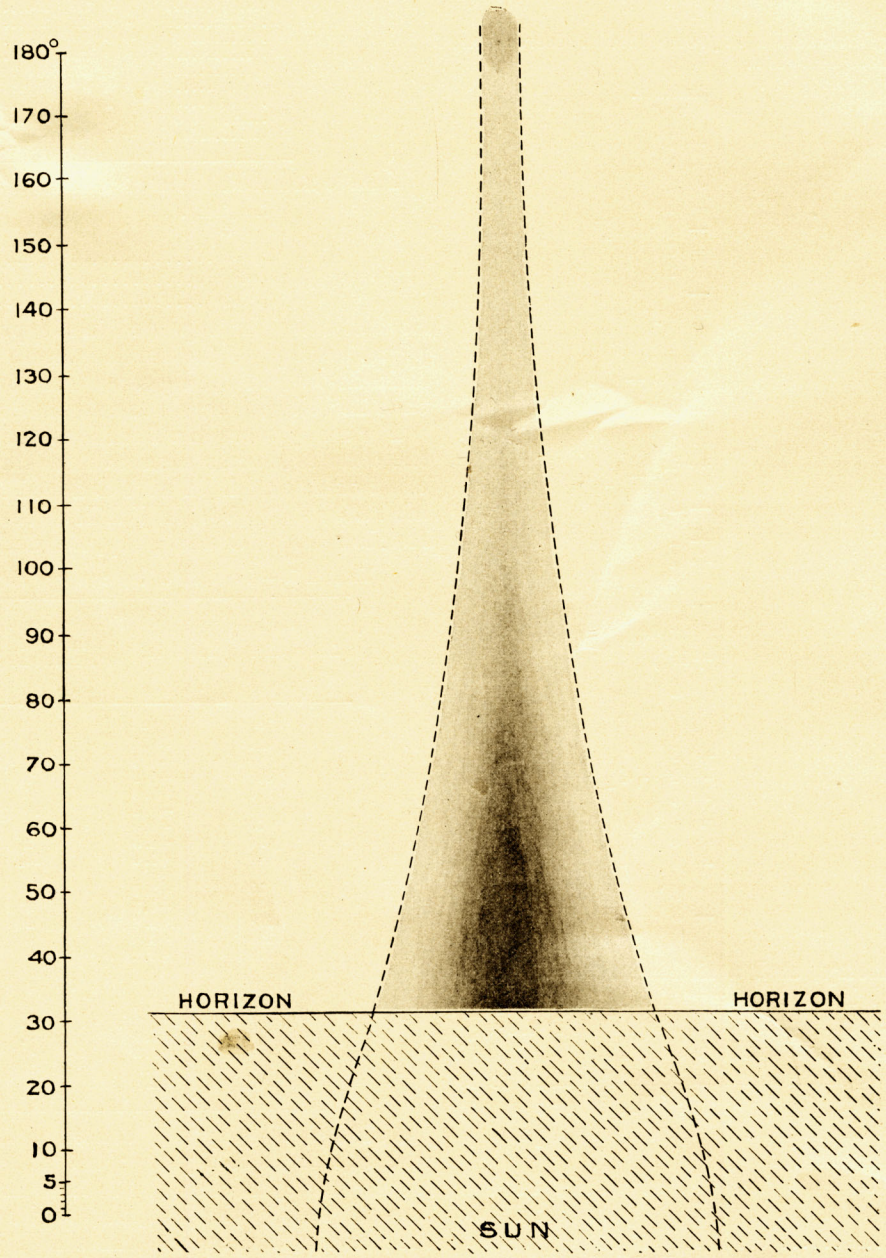

FIG. 1.—General form of the zodiacal light as seen at Kempshot Observatory after sunset in March.

We have now to consider the latitude of various points along the axis of the light; and at first it would seem proper to group the latitudes according to angular distance from the sun; but it will be found that no further information is gained; and for some time after the observations were made it appeared that this most careful work had failed just as the more ordinary observations in past years.

But if, instead of grouping the latitudes according to their distances from the sun, we group them according to the longitudes, or distances from the first point of Aries, we get the values in Table 5.

TABLE 5.—*Location of axis of zodiacal light from Jamaica observations, 1899 and 1901.*

Longitude.		Latitude.	
°		°	
356		− 1	
0		− 3	
4		+ 2	
4		− 1	
5	5°	− 3	−1½°
8		− 1	
9		− 2	
10		− 2	
10		− 2	
37		− 1	
40	39	0	−1¼°
40		− 2	
40		− 2	
63		− 1	
63	74°	− 1	−0½°
83		+ 1	
88		− 1	
111		− 2	
149		+ 1	
189	165°	+ 3	+1⅜°
189		+ 3	
189		+ 3	
(212		+17	)
218		+ 1	
224		0	
240		0	
242		+ 5	
242	238°	+ 1	+2½°
242		+ 2	
242		+ 2	
246		+ 6	
246		+ 6	
323		0	
324	327°	− 3	−1°
335		0	

We now perceive symmetry, and a little further inquiry shows us that the zodiacal light does not follow the ecliptic as we had supposed from casual observation, but that it closely follows the invariable plane of the solar system.

This plane not only has a mathematical conception, but it may also be regarded as the original plane of the solar system, throughout which was scattered all the matter subsequently condensed into the sun and planets.

Employing the more recently determined values of the masses of the planets, I find for the invariable plane for 1900:

Inclination to ecliptic ..... 1° 35′ 2″
Longitude of ascending node ..... 106° 52′ 37″

Table 6 gives the latitudes of points on the invariable plane corresponding to points taken at every 10° along the ecliptic.

It will be seen that these observations show that the zodiacal light closely follows the invariable plane, except at about longitude 238°; and the discordance here is probably due to trouble caused by the brightness of the planet Venus in the early mornings of January 21 and 22, 1899.

In the Monthly Notices of the Royal Astronomical Society, vol. 58, Mr. Maunder published some observations he made of the zodiacal light in Egypt at the end of the year 1897 and the beginning of 1898.

TABLE 6.—*Location of the invariable plane for 1900.*

Longitude.	Latitude.	Longitude.	Latitude.
°	° ′	°	° ′
0	− 1 31	180	+ 1 31
10	1 34	190	1 34
20	1 35	200	1 35
30	1 33	210	1 33
40	1 27	220	1 27
50	1 20	230	1 20
60	1 09	240	1 09
70	0 57	250	0 57
80	0 43	260	0 43
90	0 28	270	0 28
100	− 0 11	280	+ 0 11
110	+ 0 05	290	− 0 05
120	0 22	300	0 22
130	0 37	310	0 37
140	0 52	320	0 52
150	1 05	330	1 05
160	1 16	340	1 16
170	+ 1 25	350	− 1 25

I have reduced them as well as I can, and find:

Longitude.	Latitude.
°	°
30	0
188	+ 3
323	+ 1

So that the light appeared in Egypt parallel to the invariable plane, but 1½° to the north. There is a tendency in northern latitudes to put the light too far north; even in Jamaica, latitude 18° N., the errors are all that way.

For many years Mr. Backhouse has observed the position of the counterglow as seen from a station on the northeastern coast of England. I have deduced the results in Table 7 from his Table VI, p. 104, in Vol. II of the Publications of the West Hendon House Observatory, Sunderland.

TABLE 7.—*Location of the center of the counterglow—Backhouse.*

Longitude.	Latitude.	Number of observations.	Groups.	
			Longitude.	Latitude.
°	°		°	°
321	+0.5	2		
340	−1.5	1		
351	+0.2	7		
0	+0.6	16	4	+0.4
11	−0.2	15		
18	+0.5	11		
29	+1.5	2		
40	+1.4	15½		
50	+2.1	8		
58	+1.3	3		
118	+0.8	2	98	+0.9
126	+0.3	3		
138	+0.2	9		
148	+0.6	4		
162	+1.2	6		
169	+0.6	9½		
178	+1.5	3½	181	+1.4
190	+1.2	3		
209	+2.5	2		
214	+2.5	1		

At longitude 181° the center of the counterglow coincides with the invariable plane; but at longitudes 4° and 98° it is too far north, as usual. We here have to take into consideration the time of the year, the height of the counterglow above the horizon, and the clearness and darkness of the nights at Sunderland. Unless I am mistaken the observations at longitude 181° would be taken under the best conditions.

I am unable at present to avail myself of the large number of published observations of the zodiacal light, but what we now chiefly require is a good series of observations made in southern latitudes.

It thus appears that the invariable plane still contains such a large quantity of meteoric matter as to reflect back the light of the sun in the form we have described in this article; that the counterglow is due to the "full moon" phase of the particles of matter, and that all the irregularities of light are due to the irregularities in the distribution of the matter.

There is only one point left for explanation, and this is the band-like appearance of the light at distances from the sun of more than 90°.

Many years ago I made a careful reduction of the star gages of the two Herschels in order to eliminate the Milky Way as far as possible, for Proctor had shown that there is good reason for supposing that the Milky Way is an irregular stream of stars at no great distance, comparatively speaking, from our solar system. The results are given in Table 8. The north galactic pole was taken to be at right ascension $12^h\ 47^m$, north polar distance 59° in 1860, and the numbers of stars given are those seen in the field of view of a telescope 15 inches in diameter. I may say that the observations were very irregularly distributed over the heavens; in some of the areas marked off by galactic longitudes and latitudes there were a large number of observations, in others there were none at all.

TABLE 8.—*Herschel's star gages.*

Galactic north polar distance.	Number of stars in field of view.
° °	
0 to 15	No observation made.
15 to 30	5.2
30 to 45	7.0
45 to 60	12.2
60 to 75	21.8
75 to 90	41.1 not on Milky Way.
	133.9 on Milky Way.
90 to 105	126.1 on Milky Way.
	49.2 not on Milky Way.
105 to 120	27.2
120 to 135	13.4
135 to 150	9.1
150 to 165	6.5
165 to 180	5.7

It will here be seen that the rise in the number of the stars, from about 45 on or near the Galactic equator to 130 on the Milky Way itself, produces that band-like appearance so familiar to us all, and so it is with the zodiacal light—there is somewhat rapid condensation near the invariable plane which produces the same appearance as in the case of the Milky Way.

THE ZODIACAL LIGHT—IS IT METEOROLOGICAL OR ASTRONOMICAL?

In printing the preceding memoir by Mr. Maxwell Hall, on the zodiacal light, we hope to contribute something to the question whether this appearance in the sky is due principally to astronomical or meteorological conditions. For two centuries it was considered to be a purely astronomical phenomenon, and supposed to be a flat disk ring of meteoric matter inside the orbit of Venus; but, as observations increased, the extent of the orbit had to be increased, until finally the very accurate work by Rev. George Jones, carried out during the Wilkes Exploring Expedition around the globe, and published in full in one large volume, established beyond a doubt the fact that the orbits of the meteors must extend beyond the earth's orbit. As this seemed incompatible with the stability of the earth's orbit, efforts were made to reconcile the observations with the hypothesis that we were observing a meteoric ring revolving about the earth, analogous to the inner crêpe or dusky ring of Saturn. But the laws of mechanics forbade the permanent existence of such a ring. Attention was then called to the fact that we have no record of the zodiacal light ever having been observed from the high mountain tops; whence it follows that, in some way or other, this light must have its origin in some condition peculiar to the lower atmosphere. Therefore for many years the zodiacal light has been noted by meteorological observers, especially by those who have some interest in astronomy. The conclusions arrived at by Dr. Maxwell Hall, however, would relegate the phenomenon to the department of astrophysics instead of terrestrial physics, so that the only influence of the atmosphere would be to render obscure the fainter details. If this be so then the light should be visible from the summits of mountains even better and more frequently than from the low lying stations; and we especially commend it to the attention of observers at high stations throughout the world, whether on plateaus or on mountains.—*C. A.*

CORRIGENDA.

MONTHLY WEATHER REVIEW for October, 1905, Vol. XXXIII, No. 10, page 445, first column, line 1; for "August 24" read "August 4". Also in the same column, the first line beneath the dash, for "—4" read "—2".

MONTHLY WEATHER REVIEW for January, 1906, Vol. XXXIV, No. 1, page 14, second column, table at foot: in every case for "*F*" read "*C*"; also page 15, second column, Table 8, at head of each subcolumn make the same change.

MONTHLY WEATHER REVIEW for January, 1906, Vol. XXXIV, No. 1, page 15, first column, line 17, for "cirro-cumulus" read "strato-cumulus." Page 30, second column, line 2, beneath title "Tornadoes," etc., for "Wake County, N. C.," read "Rowan County, N. C."

MONTHLY WEATHER REVIEW for March, 1906, page 111, second column, line 2, for

$$\frac{1}{z}\int_{z_0}^{z} T = T_m, \text{ and } \frac{T_m}{T_0} = (1 + 0.367\,\theta) = (1 + a\theta),$$

read

$$\frac{1}{z - z_0}\sum_{z_0}^{z} T_z = T_m, \text{ and } \frac{T_m}{T_0} = (1 + 0.367\theta) = (1 + a\theta).$$

Page 114, first column, formulas (42) and (43), and the text below, change the expressions for angular velocity from $(2n + \nu)$ to $(2\omega + \nu)$.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

North Atlantic weather was notably severe. During the first half of the month low barometric pressure prevailed over the British coasts and the barometer continued high over the Azores. During the last half of the month an area of high barometer persistently covered the British Isles, and low barometric pressure and stormy weather prevailed from the region of the Azores eastward over southwestern Europe.

In the United States the course and character of areas of high and low barometric pressure produced strikingly abnormal weather. Temperature was generally deficient, and in an area extending from the lower Ohio Valley over the middle-eastern slope of the Rocky Mountains the deficiency was 9° to 10° F. Except on the north Pacific coast and in limited areas east of the Rocky Mountains precipitation was in excess of the March average, and in interior portions of the middle and east Gulf States, Georgia, and northern California the excess exceeded four inches. Southern and eastern districts were visited by a number of storms of unusual severity, and the second decade of the month covered a period of exceptionally low temperature and heavy snow in an area extending from Lake Superior over the Missouri Valley and the middle and northern Rocky Mountain and Plateau districts.

From the 1st to 4th an area of low barometer advanced from Colorado to the Canadian Maritime Provinces, attended by heavy snow in the Middle-western and Northwestern States on the 1st and in the Missouri Valley and the northern Lake region on the 2d, and by heavy rain from the southern Lake region and the Ohio Valley to the east Gulf and south Atlantic